

Neptune's Infrared Spectrum from ISO LWS and SWS Observations

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Neptune was observed by the Infrared Space Observatory (ISO) Long Wavelength Spectrometer (LWS) with particularly long integration times at ten discrete wavelengths between 46 and 178 microns. Below 130 microns, the accuracy of these measurements is ~ 0.3 Kelvins in brightness temperature. Neptune was also observed by the Short Wavelength Spectrometer (SWS) between 29 and 45 microns whose spectrum was in good agreement with the LWS near the LWS 46-micron point and with Voyager IRIS observations. The spectrum is sensitive to the helium/molecular hydrogen ratio, implying a helium mixing ratio of 15% if methane is assumed to be 2% in the troposphere. The fitting uncertainty is 4%. The value is consistent with one derived by comparing Voyager IRIS and radio science observations, a technique whose accuracy has recently been called into question. The model does not require the presence of an optically thick methane cloud. The data together, covering 75% of the outgoing thermal flux from Neptune, imply an effective temperature of 60 Kelvins, with an uncertainty of 4%, a value also close to that derived from the Voyager IRIS experiment.